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Gray Davis
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ATTACHMENT 4

TO: (1) Barbara Evoy
Chief, Office of Statewide Consistency

(2) Jose Angel
TMDL Development
Colorado River Basin Regional Water Quality Control Board

FROM: Frank Limacher
Economics Unit
Office of Statewide Consistency

DATE: October 12, 2000

SUBJECT: REVIEW OF NEW RIVER WASTE WATER TREATMENT COSTS

The Economics Unit was requested to review cost estimates for five waste water treatment and disinfection facilities discharging directly or indirectly into the New River, in the Imperial Valley. The sites vary greatly in the amounts of average daily and peak daily discharge, and include McCabe School, Date Gardens, Seeley, Westmoreland, and Brawley.

Two sets of cost estimates were submitted for review. Trojan Technologies, Inc. provided an estimate of the cost of the equipment necessary for chlorination and dechlorination. These costs include the cost of purchase and installation of equipment, but do not include the costs of new storage ponds and other facilities. Rick Eisman of Coombs Hopkins, Inc. provided an estimate of the total cost of constructing and operating the plants. These figures were intended to represent an upper limit on the cost of constructing and operating the plants.

The costs estimates were examined by John Herren, an engineer with the Division of Water Quality. His conclusion was that the cost estimates of the larger dischargers was relatively accurate but that the smaller discharger costs seemed somewhat too high. This observation verified the statements made by the engineer from Coombs Hopkins, who had prepared the estimates to represent dischargers in an urban setting.

A significant share of the cost of constructing the necessary waste water treatment facilities is the removal and disposal of excess soil resulting from the construction of ponds. In a rural setting, such as at McCabe School or Date Gardens, the costs are likely to be substantially lower than those used in the Coombs Hopkins estimates, so total costs are likely to be lower than the

costs in the table below. However, lacking site-specific information, a more exact lower cost amount could not be determined.

The following chart summarizes the discharge information, and capital and annual costs, for the five facilities:

- Average Daily Flow and Peak Daily Flow, both expressed in gallons per day
- Total Capital Costs, including the complete costs of excavation and excess soil disposal, and construction, equipment and installation
- Amortized Capital Costs, calculated for 20 years, at 6% annual rate
- Annual Operating and Maintenance (O&M) Costs, in current year value
- Total Annual Cost, the added Amortized Capital and Annual O&M costs. This approximates the annual outlay sufficient to pay for the entire project for the twenty year period. This is expressed in current value.

Waste Water Treatment Facilities: Daily Amounts and Annual Costs					
	McCabe School	Date Gardens	Seeley	West- moreland	Brawley
Avg. Daily Flow (gal/day)	1,500	11,000	15,000	225,000	4.2 million
Pk. Daily Flow (gal/day)	4,500	22,000	30,000	500,000	8.4 million
Total Capital Cost	\$100,000	\$100,000	\$250,000	\$500,000	\$1,000,000
Amortized Capital Cost	\$8,700	\$8,700	\$21,800	\$43,600	\$87,000
Annual O&M Cost	\$12,000	\$15,000	\$20,000	\$24,000	\$90,000
Total Annual Cost	\$20,700	\$23,700	\$41,800	\$67,600	\$177,000

FIBERMAT - FULL INSTALLATION

Install FIBERMAT on a conventional drainage ditch

SAMPLE FIBERMAT costs from Ewing Irrigation

(Mark Thomas and John Shering)

To build a fibermat ditch to serve 40, 60, or 80 acres of farmland

C 350 Fiber Mat	unit price	(approximately 1 3/8 inch thick, biodegradable)			
	\$ 172	2	m (x)	30	m each roll
C 350 mat is suitable for multi-year use (estimate 3 years).		39	/	1	m
		6.5	ft (x)	97.5	ft
	\$ 1.76 per linear foot, 6.5 ft. wide				
	1320 ft per 0.25 mile				
	40 acres for 1/4 mile run (x) 1/4 mile fall				
	\$ 58 per acre				

C 125 Fiber Mat	unit price	(approximately 5/8 inch thick, biodegradable)			
	\$ 116	2	m (x)	30	m each roll
C 125 mat is suitable for single-year use		39	/	1	m
		6.5	ft (x)	97.5	ft
	\$ 1.19 per linear foot, 6.5 ft. wide				
	1320 ft per 0.25 mile				
	40 acres for 1/4 mile run (x) 1/4 mile fall				
	\$ 39 per acre				

If the mat is installed in a conventional ditch, in 6 + ft width, significant labor is involved
Estimated labor 25 hours, at \$8 per hour, or \$200. This is equivalent to an additional \$0.15 per foot.

For a 160-acre location with standard 6% roads and ditches, the typical costs will depend on field run and ditch length.

field dimensions:

width	head-to-drain dist.	gross acres
1320	1320 (1/4 mile run)	40
1320	1980 (3/8 mile run)	60
1320	2640 (1/2 mile run)	80

C 350	\$ 1.76 / linear foot, materials	\$ 0.15 / linear foot, labor to install
	3 yr. product life	\$ 0.25 / linear foot, seasonal maintenance

	<u>mat's</u>	<u>install.</u>	<u>3-yr maint.</u>	annual cost per foot
3-yr.costs per foot of drain	\$ 1.76	\$ 0.15	\$ 0.75	\$ 0.89

per acre costs vary by length of field run:	1/4 mile	3/8 mile	1/2 mile
(Annual)	\$ 29.37	\$ 22.03	\$ 14.69

C 125	\$ 1.19 / linear foot, materials	\$ 0.15 / linear foot, labor to install
	1 yr. product life	\$ 0.25 / linear foot, seasonal maintenance

	<u>mat's</u>	<u>install.</u>	<u>maint.</u>	annual cost per foot
1-yr.costs per foot of drain	\$ 1.19	\$ 0.15	\$ 0.25	\$ 1.59

per acre costs vary by length of field run:	1/4 mile	3/8 mile	1/2 mile
(Annual)	\$ 52.46	\$ 39.35	\$ 26.23

FIBERMAT - PARTIAL INSTALLATION

Install a FIBERMAT on the approach to a drain drop-box

C 350 installed in the final :				
400 ft of a ditch				
with a run of	1/4 mile	3/8 mile	1/2 mile	
	\$ 8.90	\$ 6.68	\$ 4.45	

C 125 installed in the final :				
400 ft of a ditch				
with a run of	1/4 mile	3/8 mile	1/2 mile	
	\$ 15.90	\$ 11.92	\$ 7.95	

Annualized Cost of Sediment Control Improvement Projects

Grass-planted Shallow, Wide Drainage Ditch

3-year cycle 40 acres (gross acreage, 37 net)
 36.5 acres net with crop

4 fields of 40 acres each, so equipment
 delivery costs are grouped.

0.4 acre for each 1/4 mile ditch.

Ditch total width 12 feet, depth at center 8 inches
 grass cover mowed to 2 inches in height.

Effective ditch width is 9 feet, with 9:1 side slope.

Ditch surface is planted to mixture of zorro fescue, rose clover
 blando brome, and can have a life expectancy of 3 years
 (or 10 years in orchard use).

Construction Costs (in Total	Per acre
grader , 4 hrs \$120	\$3.29
grader delivery \$60	\$1.64
seed \$50	\$1.37
fertilizer \$10	\$0.27
broadcast/harrow \$140	\$3.84
\$380.00	\$10.41

Maintenance Costs (annual Total	Per acre
3 (x) chopping/mowing \$40	\$1.10
3 (x) chopper/mower deliver: \$30	\$0.82
Weed/pest cntl \$25	\$0.68
\$95	\$2.60

			Equivalent Annual			
current price			Real Discount Rate		Expenditure	Real Discount Rate
maintenance costs			6.0%		\$188	6.0%
project	constr.	+ weed/pest	TOTAL	Present	TOTAL	Present
year	cost		cost	Value	cost	Value
1	\$380		\$380	\$380	\$188	\$188
2		\$95	\$95	\$90	\$188	\$177
3		\$95	\$95	\$85	\$188	\$167
4	\$380		\$380	\$319	\$188	\$158
5		\$95	\$95	\$75	\$188	\$149
6		\$95	\$95	\$71	\$188	\$140
7	\$380		\$380	\$268	\$188	\$133
8		\$95	\$95	\$63	\$188	\$125
9		\$95	\$95	\$60	\$188	\$118
10	\$380		\$380	\$225	\$188	\$111
11		\$95	\$95	\$53	\$188	\$105
12		\$95	\$95	\$50	\$188	\$99
13	\$380		\$380	\$189	\$188	\$93
14		\$95	\$95	\$45	\$188	\$88
15		\$95	\$95	\$42	\$188	\$83
16	\$380		\$380	\$159	\$188	\$78
17		\$95	\$95	\$37	\$188	\$74
18		\$95	\$95	\$35	\$188	\$70
19	\$380		\$380	\$133	\$188	\$66
20		\$95	\$95	\$31	\$188	\$62
21		\$95	\$95	\$30	\$188	\$59
TOTAL	\$2,660	\$1,330	#####	\$2,439	\$3,948	\$2,344

these values are made equal with an annual expenditure c \$188

Averaged over a production acreage of: 36.5 acres

The expected sediment retention for the 18.25 tons/yr

The annual const + maint. costs are \$5.15 per acre

The lost profit from the grass strip: \$40 = \$1/ac.

The effective annual cost is: \$6.15 per acre

The price for one ton of sediment removed from t \$12.30

Annualized Cost of Sediment Control Improvement Projects
Grass-planted Wide-ditch drainage

5-year cycle

project year	current price		TOTAL cost	Real Discount Rate		Equivalent Annual	
	constr. cost	maintenance costs + weed/pest		6.0%	Present Value	Expenditure TOTAL cost	Real Discount Rate 6.0% Present Value
1	\$380		\$380	\$380	\$380	\$159	\$159
2		\$95	\$95	\$90	\$90	\$159	\$150
3		\$95	\$95	\$85	\$85	\$159	\$142
4		\$95	\$95	\$80	\$80	\$159	\$133
5		\$95	\$95	\$75	\$75	\$159	\$126
6	\$380		\$380	\$284	\$284	\$159	\$119
7		\$95	\$95	\$67	\$67	\$159	\$112
8		\$95	\$95	\$63	\$63	\$159	\$106
9		\$95	\$95	\$60	\$60	\$159	\$100
10		\$95	\$95	\$56	\$56	\$159	\$94
11	\$380		\$380	\$212	\$212	\$159	\$89
12		\$95	\$95	\$50	\$50	\$159	\$84
13		\$95	\$95	\$47	\$47	\$159	\$79
14		\$95	\$95	\$45	\$45	\$159	\$75
15		\$95	\$95	\$42	\$42	\$159	\$70
16	\$380		\$380	\$159	\$159	\$159	\$66
17		\$95	\$95	\$37	\$37	\$159	\$63
18		\$95	\$95	\$35	\$35	\$159	\$59
19		\$95	\$95	\$33	\$33	\$159	\$56
20		\$95	\$95	\$31	\$31	\$159	\$53
TOTAL	\$1,520	\$1,520	#####	\$1,931	\$1,931	\$3,180	\$1,933

these values are made equal with an annual expenditure c \$159

Averaged over a production acreage of: 36.5 acres The expected sediment retention for the 18.25 tons/yr

The annual const + maint. costs are \$4.36 per acre The lost profit from the grass strip: \$40 = \$1/ac.

The effective annual cost is: \$5.36 per acre The price for one ton of sediment removed from t: \$10.71

Note: data revised from Stanislaus report, page 147.
West Stanislaus Sediment Reduction Plan, Feb 1992.
USDA Soil Conservation Service, Davis, California.

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APPENDIX III: Sediment Pond Construction and Maintenance

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Appendix III

Annualized Cost Estimate

Construct a 5.45 a.f. capacity pond

160 acres (gross acreage, 147 net acres pre-pond)

145 acres post-pond

Construction Costs (initial):

	Total	Per acre
pond	\$5,750	\$39.66
inlet/outlet	\$480	\$3.31
	<u>\$6,230</u>	<u>\$42.97</u>

Maintenance Costs (annual):

	Total	Per acre
Excavation	\$1,425	\$9.83
\$11,400 5 yr cycle		
Weed/pest cntl	<u>\$400.00</u>	<u>\$2.76</u>
	<u>\$1,825</u>	<u>\$12.59</u>

project year	current price			TOTAL cost	Real Discount Rate 6.0% Present Value	Equivalent Annual	
	constr. cost	Cleanout each 8 yrs	weed/pest \$400			Expenditure \$2,728	Real Discount Rate 6.0% Present Value
1	\$6,230			\$6,230	\$6,230	\$2,728	\$2,728
2			\$400	\$400	\$377	\$2,728	\$2,574
3			\$400	\$400	\$356	\$2,728	\$2,428
4			\$400	\$400	\$336	\$2,728	\$2,290
5			\$400	\$400	\$317	\$2,728	\$2,161
6		\$11,400	\$400	\$11,800	\$8,818	\$2,728	\$2,039
7			\$400	\$400	\$282	\$2,728	\$1,923
8			\$400	\$400	\$266	\$2,728	\$1,814
9			\$400	\$400	\$251	\$2,728	\$1,712
10			\$400	\$400	\$237	\$2,728	\$1,615
11		\$11,400	\$400	\$11,800	\$6,589	\$2,728	\$1,523
12			\$400	\$400	\$211	\$2,728	\$1,437
13			\$400	\$400	\$199	\$2,728	\$1,356
14			\$400	\$400	\$188	\$2,728	\$1,279
15			\$400	\$400	\$177	\$2,728	\$1,207
16		\$11,400	\$400	\$11,800	\$4,924	\$2,728	\$1,138
17			\$400	\$400	\$157	\$2,728	\$1,074
18			\$400	\$400	\$149	\$2,728	\$1,013
19			\$400	\$400	\$140	\$2,728	\$956
20			\$400	\$400	\$132	\$2,728	\$902
21		\$11,400	\$400	\$11,800	\$3,679	\$2,728	\$851
TOTAL	\$6,230	\$45,600	\$8,000	\$59,830	<u>\$34,014</u>	\$57,288	<u>\$34,018</u>

these values are made equal with an annual expenditure of:
about \$2,728

Averaged over a production acreage of: 145 acres
The annual const + maint. costs are: \$18.81 per acre
The effective annual cost is: \$19.81 per acre

The pond sediment retention is expected to be 5.388 tons/yr-ac
The lost profit from the pond of size: 1 \$145 = \$1/ac.
The price for one ton of sediment removed from the \$3.68

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APPENDIX IV: Cost of employing an additional irrigator in vegetable and row crops

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Appendix IV

Determine the Per-Acre Cost

70.0% field crops
 30.0% vegetables/row crops

Irrigators paid in 24-hr shift
 \$130 per day, for 40 acres
 applied to field crops

COMPARE COSTS:

Veg/Row Crop Typical Costs:

Irrigation labor costs vary
 When irrigators are paid hourly rate \$7.50 per hour

costs for vegetable/row crops		# irrigations	Approximate labor cost per irrigated acre
Lettuce	\$58.50	9	\$6.50
Cotton	\$60.00	10	\$6.00
Melons	\$60.00	8	\$7.50
Watermelons	\$72.50	10	\$7.25
Carrots	\$82.50	8	\$10.31
Onions	\$97.50	12	\$8.13

This indicates an irrigation rate of 2 acres per hour
 performed by 2 irrigators, working together

If an additional (third) irrigator is hired, the irrigation cost increases
 by about \$35 per acre of vegetable/row crops

This cost increase would represent a total increase in cost of production
 of these crops by about 1% to 3%.

Field (flood-irrigated) Crops, Typical Costs:

		per acre	per hour	No. of irrig/yr	per acre seasonal cost
80 -acres, 2 fields					
alfalfa	\$ 130 per day for one irrigator	\$1.63	\$5.42	16	\$26.00
sudan	\$ 130 per day for one irrigator	\$1.63	\$5.42	6	\$9.75

replaced by 2 irrigators, each working 12 hours, at \$7.50 per hour:
 The increased cost for irrigators will increase 40% from the current level
 Then, the **annual production cost increase for alfalfa** is approximately **1.3%**

97-98 avg acres **revenue/acre**

VEGETABLES, all	106,740	
Asparagus (+ new pl.)	5,801	\$4,285
Broccoli	8,601	\$4,746
Cabbage (gr)	1,123	\$3,942
Cantaloupes (spr + fall)	15,156	\$2,958
Carrots (tot)	16,215	\$3,907
Cauliflower	3,387	\$5,007
Sweet Corn (f + s)	5,322	\$2,352
Honeydew etc (spr+fall)	1,528	\$3,509
Lettuce, Head (tot)	20,180	\$4,384
Lettuce, Leaf	8,794	\$6,516
Misc. Veg.	5,361	\$5,094
Onions (tot)	10,043	\$3,748
Potatoes	2,703	\$4,011
Tomatoes	654	\$5,788
Watermelons	1,875	\$6,173
Sugar Beets	35,995	\$1,477
Cotton lint + seed	7,267	\$1,430

VEGETABLES & ROW CROPS 150,001 27.5%

FIELD CROPS (non-row)	390,694	71.6%
Alfalfa Hay	172,220	\$801
Misc. Field crops	19,229	\$613
Sudangrass Hay	78,815	\$523
Wheat	88,657	\$489
Bermudagrass Hay	31,774	\$367

TREE CROPS, all 4,913 0.9% \$5,712

ALL CROPS, TOTAL 545,608

Note: Data source, Imperial County Agricultural
 Commissioner's Crop Reports, 1997 and 1998.

and the annual **cost increase for sudan** is approximately **0.8%**